

CLAIMS

What is claimed is:

- 5
1. An apparatus for etching stacks on a substrate, comprising:
- a plasma chamber with chamber walls;
- a plasma confinement device for reducing plasma contact with the chamber walls;
- a gas source, comprising:
- a fluorine containing gas source;
- an ammonia containing gas source;
- plasma generation and energizing device; and
- 10 an exhaust system for pumping plasma away.
2. The apparatus, as recited in claim 1, further comprising a chuck for supporting the substrate within the plasma chamber, wherein the plasma confinement device confines the plasma adjacent to the substrate.
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3. The apparatus, as recited in claim 2, wherein the stack comprises a layer with a low dielectric constant material and an etch stop layer.
4. The apparatus, as recited in claim 3, wherein the plasma generation and energizing device comprises an upper electrode and a lower electrode spaced apart from the upper electrode.
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5. The apparatus, as recited in claim 4, wherein the plasma confining device comprises a plurality of spaced apart plasma rings.

6. The apparatus, as recited in claim 5, wherein the upper electrode and lower electrode are spaced apart by a distance less than 2.0 cm.

7. The apparatus, as recited in claim 6, wherein the exhaust system is able to maintain a pressure below 300 mTorr within the chamber walls.

8. The apparatus, as recited in claim 1, wherein the plasma generation and energizing device comprises an upper electrode and a lower electrode spaced apart from the upper electrode.

9. The apparatus, as recited in claim 8, wherein the plasma confining device comprises a plurality of spaced apart plasma rings.

10. The apparatus, as recited in claim 9, wherein the upper electrode and lower electrode are spaced apart by a distance less than 2.0 cm.

11. The apparatus, as recited in claim 10, wherein the exhaust system is able to maintain a pressure below 300 mTorr within the chamber walls.

12. The apparatus, as recited in claim 8, wherein the upper electrode and lower electrode are spaced apart by a distance less than 2.0 cm.

<sup>13</sup>  
14. The apparatus, as recited in claim 1, wherein the plasma confining device comprises a plurality of spaced apart plasma rings.

<sup>14</sup>  
15. The apparatus, as recited in claim <sup>13</sup>14, wherein the exhaust system is able to maintain a pressure below 300 mTorr within the chamber walls.

<sup>15</sup>  
16. A method of etching a stack, comprising:

placing the stack in a plasma processing chamber;

flowing a fluorine containing gas into the plasma processing chamber;

flowing an ammonia containing gas into the plasma processing chamber;

generating a plasma; and

etching the stack.

<sup>16</sup>  
17. The method, as recited in claim 11, further comprising confining the plasma to reduce plasma contact with chamber walls.

<sup>17</sup>  
18. The method, as recited in claim 12, wherein the stack comprises a low dielectric constant layer and an etch stop layer over a substrate.

<sup>18</sup>  
19. The method, as recited in claim <sup>16</sup>17, wherein the fluorine containing gas and the ammonia containing gas are provided in an alternating manner and wherein a plasma is generated from the fluorine containing gas and a plasma is generated from the ammonia containing gas.